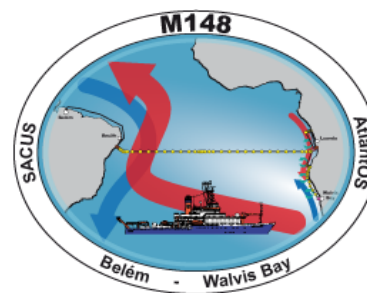


FS METEOR Cruise M148

May 24 to June 29, 2018

Belém (Brazil) – Walvis Bay (Namibia)



3rd Weekly Report, June 10, 2018

On this Sunday mooring we are crossing the Mid-Atlantic Ridge to continue our transatlantic section along 11°S in the Angola Basin. The work program in the Brazil Basin was successfully completed. Our observational program includes full-depth profiles using the CTD-Rosette with mounted sensors measuring different parameters such as temperature, salinity, pressure, oxygen, turbidity, velocity from acoustic Doppler current profilers and particle size classes using an underwater vision profiler. Water samples from Niskin bottles are analyzed on board for salinity, oxygen and nutrients. Additionally, water samples are being prepared for the analysis of trace gas concentrations, isotopic fractionation of nutrients and to quantify the amount of micro plastic particles in our labs in Kiel, Geesthacht and Odense.

The northern Brazil Basin is a key region for the exchange of water masses, heat and salt between the Northern and Southern Hemisphere. This region is also well suited for investigating the propagation of water mass signals for example from the North Atlantic, the Agulhas region, or the Southern Ocean. Interestingly, full-depth hydrographic data along a transatlantic section at 11°S was collected previously during the World Ocean Circulation Experiment in April 1994. A comparison of our data to the hydrographic data collected 24 years ago allows evaluating long-term changes in water mass properties.

One of the most prominent signals of changes in the global climate system is the ongoing warming of Antarctic Bottom Water (AABW). This warming was traced by observations along its spreading paths from the Antarctic shelves into the deep ocean basins. In the Atlantic, AABW spreads northward exclusively in the Brazil Basin where it is found below 4000 m depth (Fig. 1). Warming rates of 0.02-0.03°C per decade have been reported from the Vema Channel and the southern Brazil Basin. The comparison of our hydrographic data to the 1994 data showed a warming of deep AABW of 0.1°C per decade – much higher than we had expected. The AABW warming expresses itself through a deepening of isopycnals. In turn, this deepening implies a loss of volume of the densest AABW waters with time. The reason for the globally observed AABW warming is not yet fully established and subject of ongoing investigations. Other pronounced water mass signals found in the data comparison are an oxygen decrease in the AABW layer and a warming and salinity increase of the Antarctic Intermediate Water situated between 400 m and 1200 m depth at 11°S (Fig. 1). The observed changes of intermediate water properties agree with previous analysis from e.g. a study based on a global

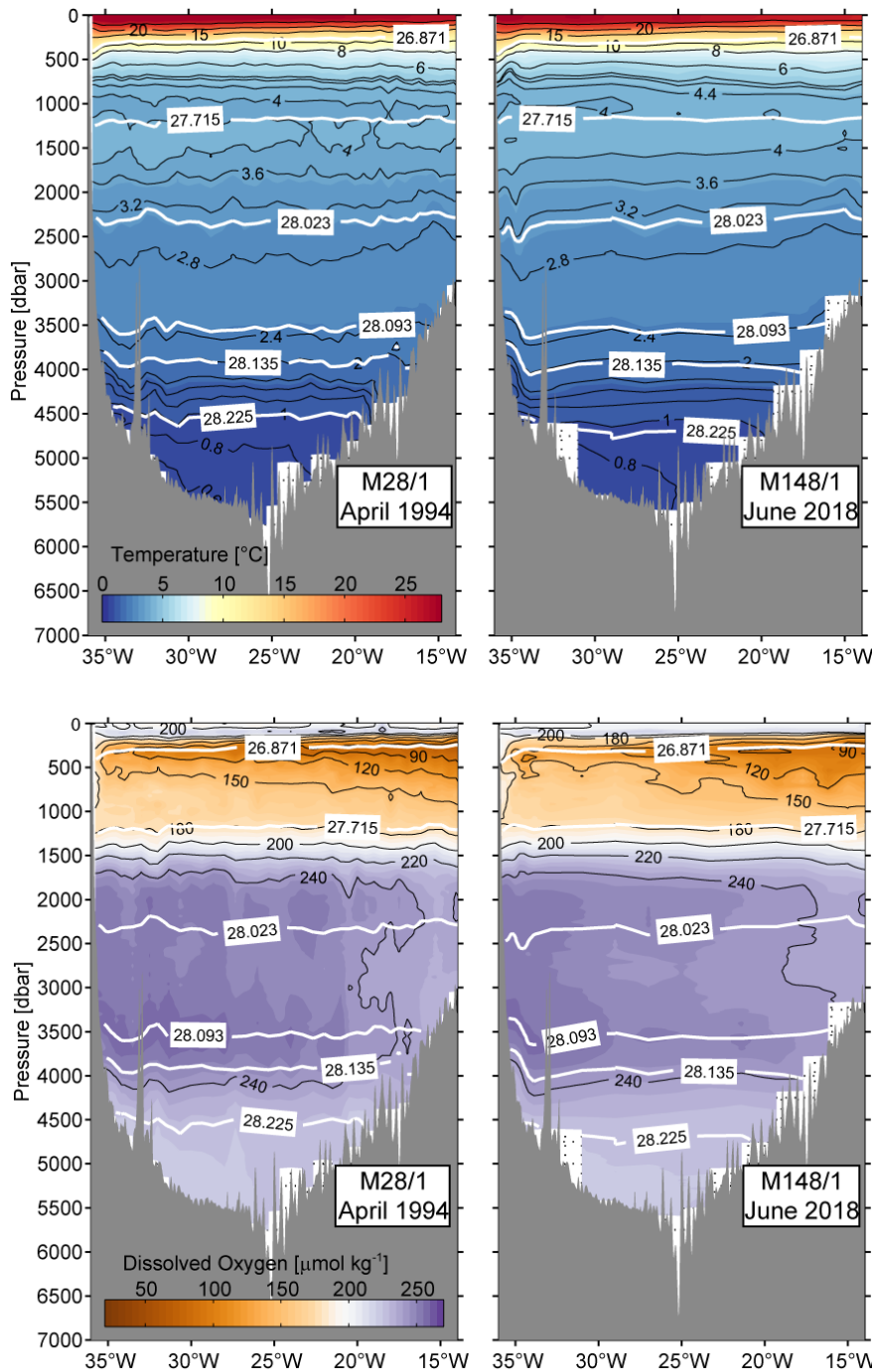


Fig. 1: Temperature- (upper) and dissolved oxygen concentrations (lower) distributions in the Brazil Basin in April 1994 (left) and today (right). White solid lines mark isopycnals of neutral density that separate water masses in the tropical South Atlantic. Antarctic Bottom Water occupies neutral densities larger than 28.135 kg m^{-3} . Antarctic Intermediate Water is found in the density range 26.871 kg m^{-3} to 27.715 kg m^{-3} .

hydrographic data base. However, the magnitude of the observed changes again exceeds results from previous studies.

The time between stations is used to present scientific results of the participants in daily seminars. The presented topics are not exclusively related to the cruise objectives and thus stimulate a comprehensive discussion of the physical and biogeochemical processes in the ocean. Collaboratively developed training programs for the POGO fellows on the calibration and processing of observed data sets and water sample analysis techniques are well implemented. Particularly well received are courses on scientific programming languages that are given by the bachelor students from Kiel University.



Fig. 2: Course on the programming language Matlab held by the bachelor students from Kiel University.

During yesterday's dinner the "Bergfest" marking the mid-cruise period was celebrated by a barbeque on the working deck. The cook and his helpers excellently prepared a suckling pig and other delicious food. Under a clear starry sky an impressive evening ended with South American music and dance.

Best regards from the tropical South Atlantic,
Marcus Dengler and the participants of M148